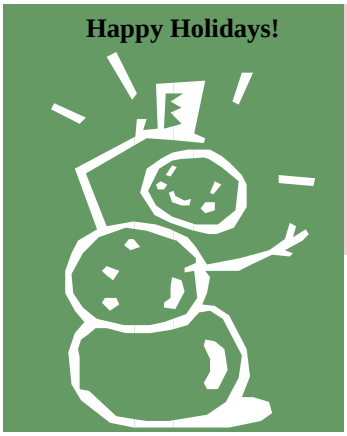


Coyote Crier

Volume 9,Issue 2
Fall/Winter 2005

National Weather Service

Great Spotter Reports!

During the monsoon season we had several great spotter reports that helped us determine the ground truth! Below are some example of great spotter reports that we received, hopefully these will give each of you an idea of what kind of information we are looking for.

On July 25, 2005 spotter #101 called in a report that strong thunderstorms winds had downed several power poles. In addition to calling in this helpful report this spotter also went the extra step and e-mailed pictures of the downed power poles.

On July 31, 2005 several spotters called in great reports of the tornado/landspout that occurred. In addition several spotters sent in great photos. One spotter in particular gave some great photos. Spotter #112 not only sent in photos of the tornado but he also gave photos of the hail that he was receiving, and an estimation of the hail size. All of the pictures and reports were very helpful!

On August 2, 2005 spotter #354 called in and reported three quarter inch hail. This report confirmed our suspicion that the storm was severe, and gave the forecasters extra confidence in the severe thunderstorm warning they already had in effect.

Each of us here at the National Weather Service Office in Tucson really appreciate the time that each of our spotters take to call and give us a report. There were so many great reports during this past monsoon season, keep up the good work!

On page 6 is the listing of what we would like called in. If you have any questions or concerns please contact Pamela Elslager or Tom Evans at (520) 670-6526.

Inside this issue:

Coyote Crier is back online! Online version of this newsletter are available through our website. Please visit **www.weather.gov/tucson** to see the latest version in digital form. From now on we would like to send out the Coyote Crier through e-mail. If you are interested in receiving the newsletter in this format rather than through the mail please e-mail and let me know. Pamela.Elslager@noaa.gov

National Weather Service Mission:
"The National Weather Service (NWS) provides weather, hydrologic, and climate forecasts and warnings for the United States, its territories, adjacent waters and ocean areas, for the protection of life and property and the enhancement of the national economy. NWS data and products form a national information database and infrastructure which can be used by other governmental agencies, the private sector, the public, and the global community."

2005 Monsoon

By: John Glueck, Lead Meteorologist

Rainfall amounts across southeast Arizona during the 2005 Monsoon were mostly below normal, thanks to the second latest start on record (July 18). However, due to the high variability of the showers and thunderstorms, a few areas did record above normal rainfall. The hottest summertime high temperatures generally ranged from between 105° F to 116° F below 5000 feet, from 90° F to 105° F between 5000 and 8000 feet, and in the 80s above 8000 feet.

Location	2005 Monsoon rainfall Rainfall	Normal	2005 Summer high Summer Max	Date
Pima County				
Tucson International Airport	5.31”	6.06”	111° F	July 17
University of Arizona campus	6.40”	5.68”	109° F	July 17
Green Valley	7.32”	8.68”	109° F	July 17
Vail	5.37”	9.18”		
Redington	6.21”	7.03”		
Anvil Ranch	4.04”	6.97”	109° F	July 17
Kitt Peak	12.50”	12.00”	93° F	July 20
Sasabe	5.43”	9.15”		
Sells	7.03”	7.71”	112° F	July 20
Ajo	2.57”	3.25”	113° F	July 18*
Organ Pipe Cactus Nat’l Monument	2.28”	4.42”	112° F	June 21
Southeast Pinal County				
Eloy	4.90”	3.85”	116° F	July 18*
Oracle	7.96”	9.71”	101° F	July 12
Picacho Peak	4.87”	3.65”	116° F	June 21
San Manuel	5.40”	6.88”	108° F	July 17
Santa Cruz County				
Nogales	9.70”	10.73”	106° F	July 6
Patagonia	8.52”	10.11”		
Santa Rita Experimental Range	10.35”	12.04”	101° F	July 17*
Tumacacori National Monument	8.21”	9.94”	108° F	June 22*
Graham County				
Fort Thomas	2.51”	3.94”	110° F	July 13
Safford Agricultural Center	2.16”	4.60”	108° F	July 13*
Greenlee County				
Duncan	3.91”	5.88”	108° F	July 12*
Clifton	3.71”	6.13”	109° F	July 15
Hannagan Meadow	10.53”	9.94”	84° F	July 12
Cochise County				
Benson	5.37”	8.89”	109° F	July 13
Cascabel	8.23”	6.98”	111° F	July 12
Pearce-Sunsites	6.17”	8.06”	103° F	July 12*
Willcox	3.97”	6.62”	104° F	July 17*
Bisbee	9.45”	11.44”	98° F	July 13*
Coronado National Memorial HQ	9.41”	10.66”	101° F	July 12*
Sierra Vista	10.62”	8.53”	102° F	June 20

Preparing for the Wrath of Mother Nature

By Jeff Davis, Lead Meteorologist

The record setting hurricane season of 2005 and the recent earthquake in Pakistan remind us that disasters can strike anywhere at anytime. Are you prepared for a disaster? Is your family or community ready? As trained SKYWARN spotters, you play an important role in providing your communities with advanced warnings of impending hazardous weather that can save lives and property. However, the devastation caused by hurricane Katrina this past summer is a reminder that accurate and advanced warnings are not enough. An increase in the levels of preparedness for yourself, your family, your neighborhood, and your community are needed to be ready for the wrath of Mother Nature.

Yourself

Disaster preparedness begins with the individual. You must be mentally and emotionally prepared to act promptly when disaster strikes. The ability to take care of yourself and utilize practical first aid as well as survival skills when needed are also an important part of individual preparedness. If you're not prepared, you will not be in a position to help others or share family and community responsibilities as a team member.

Your Family

A family action plan is the next level of preparedness. It is important that families create a disaster plan which includes a communications plan in the event of being displaced from family members and loved ones during a disaster. Every family member should be familiar with each others work, daycare, or school emergency plans. This will make you better prepared to safety reunite with your family and loved ones by knowing where they will be located after responding to an emergency.

Your Neighborhood & Community

The last level of preparedness involves your community. Community preparedness is not the work of any one group. It is the shared responsibility of every citizen in the community. After the terrorist attacks of September 11, 2001, USA Freedom Corps initiative was launched to motivate and help Americans find ways to serve their community and country. The USA Freedom Corps is comprised of the Citizen Corps, Americorps, and the Peace Corps. In Southeastern Arizona a regional Citizen Corps Council (SARCC) has been established that is represented by Cochise, Graham, Greenlee, Pima and Santa Cruz counties, their municipalities and unincorporated areas.

The Citizen Corps has 5 volunteer programs of which the Community Emergency Response Team (CERT) is one of them. The main mission of the CERT is to provide training in emergency preparedness and basic response techniques. At the regional level, the training program is designed to train local officials, who in turn, train citizens in their communities. The theme of "People Helping People" can make your community better prepared for dealing with different types of disasters. For more information on CERT, checkout the Pima County Health Department's website **http://www.pimahealth.org/cert** and get involved!

The Southern Arizona chapter of the American Red Cross also offers a variety of preparedness training classes and volunteering opportunities. For more information on disaster services, checkout the American Red Cross' website at **http://www.prepare.org** to learn more. Additional information on general disaster preparedness can be found at: **http://www.ready.gov** provided by the U.S. Department of Homeland Security.

The National Weather Service (NWS) recognizes that nearly 90% of all declared disasters are weather related, leading to around 500 deaths per year and close to $14 billion in damage. That's why the NWS started the StormReady program. StormReady is designed to help arm communities with the communication and safety skills needed to save lives and property- before and during the event. As a SKYWARN spotter, you're an integral part of StormReady. The NWS in Tucson serves the communities of southeast Arizona and would like to help your community get StormReady. For more information on the StormReady campaign, go to **http://www.stormready.noaa.gov** and help your community get ready for the wrath of Mother Nature.

StormReady
NATIONAL WEATHER SERVICE

Was it or Wasn't It? The Case of the July 31, 2005 Tornado

By: Erik Pytlak, Science and Operations Officer

Arizona averages about four tornadoes a year, many of which form as severe thunderstorms evolve into supercells. Supercell storms are accompanied by strong circulation which starts in the mid levels of a storm which sometimes descend all the way to the surface. This rotation will sometimes cause the storm to take on the classic "hook" shape appearance. If the rotation is strong enough, a tornado can develop.

On July 31st, though, the tornado near Corona de Tucson did not form from a supercell storm. Non-supercell tornadoes usually form when preexisting circulation is pulled upward into a developing cumulus cloud or thunderstorm. When the circulation is pulled upward, it stretches and narrows. This in turn causes the circulation to become stronger and more concentrated. Once the circulation reaches the cloud base, it "becomes" a tornado. The funnel itself does not even have to reach the base of the cloud – just the circulation.

While these non-supercell tornadoes are usually weaker than their supercell cousins, and usually look more like a dust devil or waterspout (some papers and journals even call these features landspouts), they can still be deadly and can occasionally reach wind speeds over 150 mph. Based on storm spotters in the area, one of whom captured the event on video, the July 31st tornado may have started out as a dust devil. However, as it was pulled into an approaching thunderstorm, the rotating column of air was stretched and reached the base of the cloud.

This event also highlights the importance of *well-trained* storm spotters. Because the circulation forms near the surface and stretches upward, it is difficult for Doppler radars to detect these tornadoes unless they are very close to the radar itself, or the radar is specially designed to pick up small circulations like these. These tornadoes usually only last a couple of minutes, so that by the time we are able to issue a warning, the tornado may already be gone. However, once one of these tornadoes forms, several others sometimes develop at once or over a period of an hour or two. To make matters even more difficult, it is easy for people to confuse these tornadoes with very common dust devils. The key for spotters is to recognize that non-supercell tornadoes still extend from the surface all the way up to cloud base, just like supercell tornadoes. The funnel cloud itself may not be complete or extend all the way up, but watching both the cloud base and the surface for rotation is perhaps the best indicator for determining if a dust-level looking feature is really a tornado or not.July 31st Tornado as seen from Corona de Tucson at 4:40 pm.

July 31st Tornado as seen from Corona de Tucson at 4:40 pm.

Picture provided by John and Mary Ball.

Providing pictures to the National Weather Service is a great way to let us know what you are seeing! Pictures of impressive storm features, hail, and storm damage are always welcome.

To send your pictures in please e-mail them to:

Pamela.Elslager@noaa.gov

Thanks to all the spotters that sent us pictures during the 2005 monsoon season.

Vortices of Southeast Arizona

By: Craig Shoemaker, Meteorologist

Several different types of vortices affect southeast Arizona and it is important for spotters to be able to differentiate between the types. This can be challenging since vortices often have misleading appearances that deviate greatly from text-book examples. This article will examine the types in an effort to provide guidance to the spotter on the differences between tornadoes, landspouts, gustnadoes and dust devils.

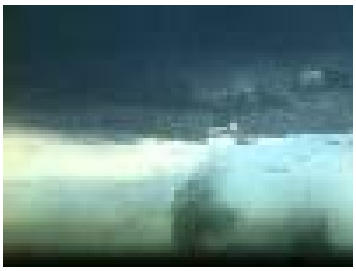
A tornado is a violently rotating column of air or vortex extending from the ground to the base of a thunderstorm that is intense enough at the surface to do damage. A condensation "funnel" does not need to be visible from the ground to cloud base for a tornado to be present; a debris cloud at the ground beneath a thunderstorm is all that is needed to confirm the presence of a tornado (even in the total absence of a condensation funnel. Wind speeds in tornadoes vary from 40 mph to 318 mph (F0 to F5 on the Fujita scale).

Dust devils are generally small vortexes not associated with thunderstorms, which are made visible by rotating clouds of dust or debris. The key here for the spotter is that they are not associated with thunderstorms and more specifically do not extend upward to the cloud base of a thunderstorm. Dust devils form due to strong surface heating during hot weather and are formed by a completely different process than that of tornadoes.
Strong heating from the sun causes the surface to become much warmer than air above the surface. This combines with uneven heating of the surface; certain terrain type's heat up more and faster than others. As a result of uneven surface heating, the warm air has a tendency to rise in bubbles. As these bubbles of warm air rise, cooler air from above and to the sides of the bubble rushes around and below to fill the void. This rush of air can happen in a somewhat uneven manner and as it reaches the center of the void filled by the bubble of rising air, can begin to spin. The combination of lower air pressure and heating causes the air, dust and debris inside the dust devil to rise. Wind speeds near the centers of dust devils can range from just a few miles per hour to perhaps as much as 70 miles per hour.

It is likely that the greater percentages of tornadoes occurring over southeast Arizona are of the landspout variety. Landspouts are caused by different mechanisms than that of tornadoes; despite the differences in how they are formed, landspouts are in fact tornadoes. However, they typically do not have the damage and life threatening potential as tornadoes. A landspout tornado here in southeast Arizona will typically begin as a strong dust devil that develops near the strengthening updraft of a thunderstorm. This dust devil is pulled into the updraft and becomes in contact with the thunderstorm cloud base near the updraft. As the dust devil is pulled into the updraft it is stretched in the vertical, which tightens the pressure gradient and spin within the vortex, causing increased wind speeds. A landspout tornado will not have a condensation funnel, typical of the classic tornado, but will instead be made visible by dust and sand. Another distinguishing feature will be the high cloud base of the landspout tornadoes' associated thunderstorm, which could be up to 10,000 feet, while the classic tornado will be much lower, around 4,000 feet. On rare occasions landspout tornadoes can cause significant damage with winds as high as 200 mph, but this generally occurs in a very small path, unlike classic tornadoes which can have long destructive paths.

Gustnadoes are short-lived, ground-based, shallow vortexes that develop on a gust front associated with either thunderstorms or showers. They may only extend to 30 to 300 feet above the surface. Again, the key here for the spotter is there will be no connection with the cloud base. They may be accompanied by rain, but usually are only visible as a debris cloud or dust whirl at or near the ground. Wind speeds can reach 60 to 80 mph, resulting in significant damage, similar to that of a F0 or F1 tornado. However, gustnadoes are not considered to be a tornado, and some cases, it may be difficult to distinguish a gustnado from a tornado. Gustnadoes are not associated with storm-scale rotation (they do not extend up into the cloud) that is involved with true tornadoes. They are more likely to be associated visually with a shelf cloud that is found on the forward side of a thunderstorm near strong outflow winds.

Dust Devil



Gustnado

Landspout

Tornado

Frontal Cyclones

By: Brian Francis, Lead Meteorologist

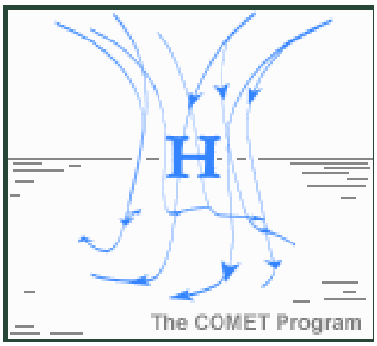
The topic of weather fronts appeared in the April 2005 issue of the *Coyote Crier*. This article will deal with the concept of ***"Frontal Cyclones"*** (or simply ***"Cyclones"***) and the associated weather regimes produced from these systems.

In very simple terms, a ***low-pressure system*** is an area of low atmospheric pressure where less air is above the surface at that point. If the pressure is lower at the surface, the surrounding air will circle in toward the center of lower pressure. This causes the air to rise above the low pressure and generate cloudy weather with precipitation. In contrast, a ***high-pressure system*** contains subsiding air that leads to clear skies and warm temperatures.

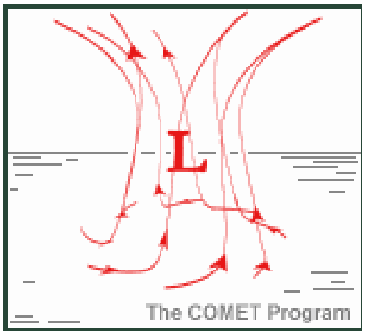
Frontal Cyclones are large traveling atmospheric vortices with centers of low atmospheric pressure. Surface winds blow counterclockwise (in the northern hemisphere) around the low-pressure center and slightly toward the center. A cold front normally extends southwestward from the center of the cyclone with a warm front extending eastward. Most midlatitude cyclones have a cold front associated with them but many do not have a warm front since the contrast in temperature and humidity between the air located toward the southeast and east of the low-pressure center is frequently insignificant.

Precipitation is associated with the rising air located over the center of the midlatitude cyclone and over weather fronts. Air is forced to rise near the center because of the convergence of air toward the lower pressure; air rises along a front as the warm air is forced upward by the colder, denser air.

In general, these traveling ***frontal cyclones*** have minimal impact on weather in southeast Arizona since they move from west to east, first entering the Pacific Northwest area then subsequently migrate across the central and eastern United States. Thus the paths of these systems are generally too far north to have much of an influence on our weather. Outside of the monsoon season, our weather is primarily influenced by low-pressure systems and high-pressure systems that reside mainly in the middle and upper portions of the atmosphere. The topic of ***closed upper lows***, or ***cutoff upper lows***, will appear in a future edition of the *Coyote Crier*.



High Pressure System



Low Pressure System

What you should report?

Tornado:	A tornado or a funnel cloud aloft
Heavy Rain:	A **half an inch or more**, if it fell in less than an hour
Hail:	**Pea size** (1/4 inch) or larger
High Wind:	Estimated or measured **40 mph or greater**
Flooding:	**Any** kind of flooding
Snow:	**One inch** or more (2 inches or more if above 5000 ft.)
Visibility:	**Less than one mile** for any reason (fog, dust, snow)
Death/Injury:	**Any** weather-related reason
Damage:	**Any** weather-related reason (most often from wind)
Earthquake:	**Any** tremor

(520) 670-5162 or 1-800-238-3747

Interested in Weather?

The American Meteorological Society has a local chapter right here in Southeastern Arizona that meets once a month. The group is called the Southeastern Chapter of the American Meteorological Society (SEACAMS). The meetings are normally held Environmental and Natural Resource building on the University of Arizona campus. For more information or to find out when the next meeting will be, please visit the following website:

http://www.atmo.arizona.edu/students/grad/gradactivity/SEACAMS/SEACAMS.htm

If you have any further questions contact one of the officers listed on the website.

* Please note that this club is not affiliated with the National Weather Service.

National Weather Service

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Check us out on the web:
http://www.weather.gov/tucson

Spotters:

Remember to keep your information up-to-date! Current phone number, address, and e-mail address help us to stay in contact with you. The easiest way to update your information is to send an e-mail to:

Pamela.Elslager@noaa.gov

The Staff at NWS Tucson

Meteorologist in Charge	**Glen Sampson**
Administrative Support Assistant	**Bonnie Maguire**
Warning Coordination Meteorologist	**Tom Evans**
Science and Operations Officer	**Erik Pytlak**
Electronic System Analyst	**Jim Schmidt**
IT Specialist	**Evelyn Bersack**
Electronic Technicians	**Kris Johnson**
	Norm Phelps
Service Hydrologist	**Mike Schaffner**
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	Brian Francis
	John Glueck
	Jim Meyer
	Greg Mollere
Forecasters	**Chris Rasmussen**
	Steve Reedy
	Craig Shoemaker
	Gary Zell
Meteorologist Intern	**Pamela Elslager**
Observations Program Leader	**Angel Corona**
Hydrometeorological Technicians	**Hans Hanson**
	Mic Sherwood

Spotter Training Dates

Date	Time	Location
January 17th	6:30 pm	U of A Campus, ENRB Room 253 520 N. Park Ave., Tucson
January 25th	6:30 pm	Oscar Yrun Community Center 3020 E. Tacoma St., Sierra Vista

For this winter season two training sessions are being offered. Anyone is welcome to attend the class and there is no need to register. Please just show up on the day of the class. Being a trained spotter is a vital part of being an informative and prepared spotter. If you cannot attend either of these training sessions, additional sessions will be offered in May to prepare for the monsoon season.

Contact us if you have any additional questions or if you would like spotter training in your area! National Weather Service (520) 670-5162. Please speak with Pam or Tom to schedule additional classes.

The National Weather Service Office in Tucson would like to wish you all a happy and healthy holiday season!